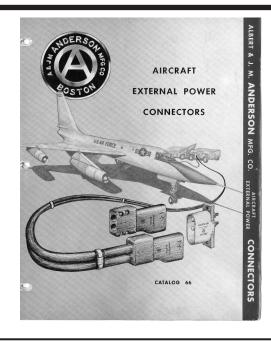


Ground Power & **Battery Connectors** for Aircraft

# THE ANDERSON FAMILY LEGACY

The name Anderson is known as an innovative leader in the Ground Power industry with over 60 years of experience in product design and manufacturing.



One of the first industry catalogues for Aircraft External Ground Power Connectors about early 1950's.

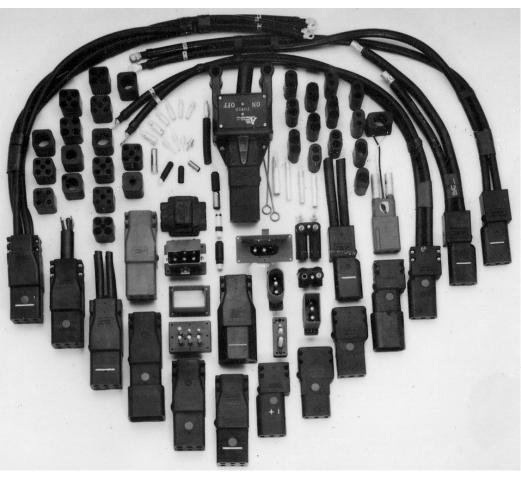
# **INDEX**

ANDERSON FAMILY LEGACY, INDEX Page1	28V DC 3 POLE 3 Wire Assemblies, R71 Page 15
ANDERSON FAMILY NOW	28V DC WEAR NOSE R800 Cable Assembly
SAVE TIME AND MONEY Page 2	100/200V DC Wear Nose R900 Cable Assembly Page 18
ANDERSON ATTACHABLE® FAMILY	80 VDC FAST CHARGE
PRODUCT OVERVIEW Page 3	R270 - 2 POWER LEADS AND 4 AUXILIARIES Page 19
QPL TEST FOR PLUGS AND CABLE ASSEMBLIESPage 4	R80 2 POWER, 1 NEUTRAL AND 6 AUXILIARIES Page 19 RAMP POWER 240/460V Page 20
BASIC ASSEMBLY PROCEDURE Page 5	ANDERSON RECEPTACLE FAMILY
GUIDE TO MILITARY STANDARDS Page 5	RECEPTACLE FAMILY PICTURE Page 21
DC ATTACHABLE® 3-POLE 28 VDC	3 POLE 28VDC RECEPTACLE Page 22
2 WIRE R65, R68 Page 6	6 POLE 110 / 200V AC RECEPTACLE Page 23
3 WIRE R64, R71, R72, R78 Page 7 4,5,6 WIRES R767, R771, SENSING, SWITCH Page 8	80VDC FAST CHARGE, 270V RECEPTACLE Page 24
AC ATTACHABLE® 6-POLE 115/200 V	ATTACHABLE HANDLE AC Page 25
R67, R112 Page 9	HANDLE AND STRAIN RELIEF DC Page 26
ATTACHABLE® POWER NOSE:	BATTERY CONNECTOR 125/600V DC Page 27-28
RUBBER BODY	AC/DCQB QUICK BREAK AWAY Page 29
AC R90 110/200 V	ACCESSORIES
DC R93 28V DC Page 10	LUG SET, CRIMP TOOL, ROTATING HEX DIE HAND
ATTACHABLE® POWER NOSE: CLAMSHELL BODY	CRIMPER AND HEX DIE CRIMPER Page 30
AC R91 110/200 V W/SWITCHES, LED OPTIONS Page 11 DC R92 28VDC W/SWITCHES, LED OPTIONS Page 11	Environmental End Caps, Strain Relief DC Cable Assemblies,
·	Test Pins, Scuff Covers, Splice Kits
AC ATTACHABLE® 6 POLE 230/400V	
R129, R130	Replacement Noses, Cable Options, Single Jacket Balanced Composite Cable Assembly Kit, Strap HangerPage 32
ANDERSON FAMILY CABLE ASSEMBLIES	
ATTACHABLE® AND OVER MOLDED FAMILY	SPECIALS
PICTURE	AWG to Metric Conversion Chart

# THE ANDERSON FAMILY NOW



### SAVE TIME AND MONEY WITH ANDERSON AIRMOTIVE – YOUR GREEN CHOICE.





Anderson Airmotive continues the tradition of design and manufacturing excellence by producing and offering the largest selection of qualified plugs, cable assemblies and receptacles covering all commercial and military requirements for 28VDC, 270VDC, 80VDC, 200VAC, and 400VAC.

Our family of Attachable® plugs are designed to be simple to assemble in the field, durable and cost effective with many options for safety and protection.

Our family of rugged receptacles offers you a choice of male or female design.

Our family of power cables is unequaled in the industry. Anderson Airmotive is the only company to offer you a choice of: (1) making/repairing your own ground power cables with our family of high quality and durable Attachable® plugs, or (2) buying a wide variety of new cable assemblies with either Attachable® or Overmolded heads, from the factory.

The "Green" contribution: With the earth's resources being consumed at ever increasing rates, it makes more sense than ever to repair your own ground power cable assemblies, in the field, with our service proven Attachable® plugs. This simple operation will not only keep your ground service running, but will eliminate costs associated with packaging, shipping and waste removal. When you choose Anderson, you choose responsibility to the planet, as well.

<sup>\*</sup> Qualified Product List by US military; German and Canadian Authorities.

# The Attachable® FAMILY OF PRODUCTS

# THE ANDERSON AIRMOTIVE ADVANTAGE

ANDERSON AIRMOTIVE is the only manufacturer with a complete line of QPL'd (MIL-C-7974D) Attachable® Plugs, as well as over molded AC and DC power connectors and cable assemblies. The connectors and assemblies have passed the stringent US and Canadian QPL tests. In addition Anderson is approved to German Standard VG 85211 and meets ISO461-1 and ISO461-2.

## THE ATTACHABLE® PLUG FAMILY INCLUDES:

### THE GRABBER CONTACT® PLUG / Portable Receptacle

The "standard" for over 10 years. The service proven Grabber Contact Attachable® plug has <u>watertight</u>, (IP068) molded-in contacts that are finger proof (UL1977) (EN1175) (VL1950) with extra safety insulation. The plug has been designed to assure consistent contact even on worn pins and under heavy loads commonly encountered on the ramp.

Listed on QPL for AS7974D

Order R67GxxE AC Plug
R65GxxE DC Plug
R112GxxE AC Portable Receptacle
R68GxxE DC Portable Receptacle
R64 GxxE DC Plug
R71G xxE DC Plug
R72G xxE DC Plug
R78GxxE DC Portable Receptacle

#### THE ATTACHABLE POWER NOSE® PLUG

The Attachable Power Nose® (APN) is designed to be the <u>quickest assembly</u> and <u>lowest overall service</u> cost in the industry. The modular construction allows easy replacement of worn components (contacts, nose, back end) for extended service life and quick repair. The body and nose are molded from Anderson's highly abrasion resistant proprietary Hypalon® rubber.

Order R90GxxE(w) AC Plug R93GxxE(w) DC Plug

#### THE ATTACHABLE POWER NOSE® WITH SWITCHES, LEDs

The newest Attachable Power Nose® (APN) for Composite or single conductors has integral O-ring seals that eliminate the need for potting. The super tough clam shells have high impact strength and great wear resistance. Waterproof switches and LEDs are available.

Order R91GxxE(y)(z)(w) AC Plug R92GxxE(y)(z)(w) DC Plug

# THE 4 OR 6 WIRE DC PLUGS

These plugs are designed to accommodate two wires per leg with optional sensing leads and switches. The plugs allow extra long cable assemblies at high current without excess voltage drop. Optional crimp lugs make assembly easier.

Order R765GxxE(w)(v) Plug R771GxxE(w)(v)Plug R768GxxE (w)(v) Portable Receptacle R778GxxE (w)(v) Portable Receptacle

### THE REPLACEABLE CONTACT PLUG

The original Attachable® with **replaceable** contacts has been in service for twenty five plus years. It is designed so that worn power contacts can be replaced.

Order R67GxxB AC Plug R65GxxB DC Plug

#### 270 DC PLUG

Plugs are designed for 270V DC applications in Attachable® and overmolded versions.

Order R270GxxE

#### 80V FAST CHARGE: B1B 230/400V AC

Plugs are designed for 80V DC fast charge application. B1B Military Plug for 230/400V application.

Order R80GxxE R69GxxE R129GxxE

All plugs are available with sensing leads or switches that allow power-up only when 80-90% engaged. All of our connectors are made from high quality, proprietary synthetic elastomer rubber, that is specially formulated for excellent chemical and abrasion resistance. Each connector has heavy silver plated tellurium copper contacts with quad beams and engineered steel springs that assure consistent contact for thousands of cycles.

# **PLUG and Cable Assembly QPL Tests**



# QUALIFICATION TESTS TO MIL-C-7974D for Ground Power Plugs and Cable Assemblies; 400 Hz AC, 28V DC

A, B. Dimensions and Examination of product Measure all dimensions as per print for MS25486 AC; MS 25488 DC

### C. Structural Integrity

Remove 1/8 inch of plug nose sides and perform all tests. This test checks performance of plug after considerable wear as in actual use.

### D. Initial Mating forces

Measure mating forces with 2 sets of receptacles (MS90362); one set +.001 from nominal; one set -.001 from nominal. Insertion must be less than 100 lbs and extraction force of 60-100 lbs for AC; insertion 50 lbs and extraction of 30-50 lbs for DC. Force measured at 8 inches per minute.

### E. Mating forces after fluid immersion

One sample is immersed in hydraulic oil and one sample is immersed in jet fuel for 20 hours. Mating forces must meet values as in C. No dimensional changes shall be evident.

F. Force measurement for individual contacts Individual power contacts shall measure 24 lbs maximum insertion (A,B,C,N), extraction 16-24 lbs.; auxiliary contacts shall measure 21lbs max. (E,F).

<u>G. Impact after low temperature exposure</u>
Plugs shall be cooled to -55C for 24 hours. An impact force of 20 ftlbs shall be applied to each side 3 times. No damage is allowed.

### H. Mating at low temperature

Plugs shall be cooled to -55C for 24 hours and then engaging as in D. The values shall not exceed 150% of nominal values.

### I. Life flexing

A plug is mated with a standard receptacle 1/4 inch from full mating. The assembly is then flexed with 20lbs force in a reciprocating mechanism for 10,000 cycles at 10 cycles per minute. The plug shall pass all tests.

J. Dielectric strength after humidity exposure Plugs shall be maintained in a humidity chamber cycled 10 times as per MIL-STD-202. All samples must pass a test potential of 2000VDC with current leakage of less than 1.0 milliampere.

### K. Voltage drop following salt spray

Plugs shall be subjected to a 5% salt spray test for 48 hours as per MIL-STD-202. The maximum voltage drop at 300 Amps shall be 45 millivolts after 5 minutes.

## L. Mating forces after current overload

Plugs shall be tested with a current overload of 700 Amps for 2/0 (7/0mm) and 1000 Amps for 4/0 (120mm) for 3 minutes. There shall be no shorting, loss of continuity, burning, rupture or other damage preventing completion of test.

### M. Cable attachment to plug

A cable assembly shall be tested with a pull force on each conductor of 100 lbs. No damage shall result from this test.

### N. Cable attachment to lug terminals

Items shall be tested in a tensile tester where each 70 mm conductor shall have a tensile strength of at least 750 lbs pull out force.

### O. Plug static strength

Plugs are mounted on a flat surface and a force 1000 lbs is applied. No damage shall result and plugs shall pass all tests.

# P. Plug bending strength

Plugs are mated with a receptacle and mounted horizontally with a weight of 64 pounds suspended at the midpoint of the plug for 5 minutes on each side of the plug. For DC plugs the weight is reduced to 32 lbs. The plug shall pass insertion, extraction after this test and show no damage.

#### Q. Band tensile strength

A cable assembly shall be heated to 71°C for 6 hours then a force of 300 lbs shall be applied to pull apart the cable bands. There shall be no tearing of bands and shifting of more than 1 inch.

#### R. Misengagement

The plug is rotated 180° and a mating force of 150 lbs is applied. No electrical contact shall occur with the auxiliary contacts.

#### S. Abrasion resistance

The plug body material shall have an abrasion resistance of at least 75% of the standard reference compound per ASTM D1630-83.

<u>T. Cable attachment to crimp barrel</u> As per test M, N

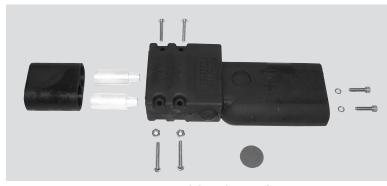
### U. Ozone resistance

A plug is heat aged at 70°C for 70 hours and then at ambient for four days. The plug shall then be ozone tested as per ASTMD1149 at 38°C for 168 hours at 50 parts ozone per hundred million parts air. No cracks shall be visible under seven power magnification after test.

# BASIC PLUG ASSEMBLY PROCEDURE



**GUIDE TO MILITARY PLUG STANDARDS** 



**R65 WITH COMPONENTS** 

# Repair Ground Power Cable Assemblies . . . Or Make New Ones.

A full line of ATTACHABLE® Plugs, Receptacles and accessories now available from ANDERSON makes it possible for you to have an adequate supply of cable assemblies on hand at all times.

- · Reduces inventory cost and space problems.
- Keeps all ground power units operational without prolonged tie-ups waiting for new cable assemblies
- · More positive, longer lasting connections.
- · No messy rubber potting or vulcanizing.
- Qualified and approved for use under all appropriate military specifications for both replacement plug and new cable assemblies.
- Environmentally friendly

# Assembly Procedure Illustrated



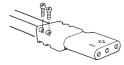
STEP 1
Prepare cables in accordance with
Instruction Card included with each
unit packaging.



STEP 2 Crimp or solder lugs to cables\*\*



STEP 3
Assemble cables to plug.



STEP 4
Secure plug to cable jackets.

# Guide to Military Standards for Attachable or Overmolded Cable Assemblies

ANDERSON CATALOG NUMBER	MS NUMBER ATTACHABLE PLUG	FOR CABLE ASSEMBLY MS NUMBER	FORMER CABLE ASSEMBLY NUMBER
R65G1E	MS25488-25	AS(MS)90347-7, -8, -9, -10, -11, -12	MS25488-6, -7, -8, -9, -10, -11
R65G2E	MS25488-26	AS(MS)90347-13, -14, -15, -16, -17, -18	MS25488-12, -13, -14, -15, -16, -17
R65G3E	MS25488-27	AS(MS)90347-19, -20, -21, -22, -23, -24	MS25488-18, -19, -20, -21, -22, -23
*R65G7E	_	AS(MS)24121-1	MS24121-1
R67G4E	MS25486-16	AS(MS)90328-13, -14, -15, -16, -17, -18	MS25486-4, -5, -6, -7, -8, -9
R67G5E	MS25486-30	AS(MS)90328-25, -26, -27, -28, -29, -30	MS25486-18, -19, -20, -21, -22, -23
*R67G12E	_	AS(MS)24208-1	MS24208-1
R67G21E	MS25486-17	AS(MS)90328-19, -20, -21, -22, -23, -24	MS25486-10, -11, -12, -13, -14, -15
R67G36E	MS25486-31	AS(MS)90328-31, -32, -33, -34, -35, -36	MS25486-24, -25, -26, -27, -28, -29
R68GxxE	_	(Mating Unit for CAT. R65)	(Mating Unit for CAT. R65)
R71G6E	MS25487-10	AS(MS)25019-20, -30, -40, -60, -80, -100	MS25487-3, -4, -5, -6, -7, -8
R112GxxE	_	(Mating Unit for CAT. R67)	(Mating Unit for CAT. R67)

<sup>\*2</sup> Heads Required for Cable Assembly.

<sup>\*\*</sup>Recommended crimp tool is the Anderson Electric VC-7 crimp tool. Consult factory for further information.

# **DC PLUGS ATTACHABLE® 3-POLE**

# Attachable® Portable Plugs and Receptacles, 3 Pole. R65 and R68 Series 28VDC



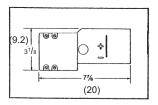
**R65 PORTABLE PLUG** 

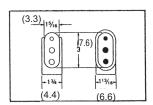


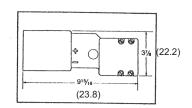
**R65 GROMMET "G"KIT** 



**R68 PORTABLE Receptacle** 







The ATTACHABLE® Portable Plugs and Receptacles are molded of a proprietary synthetic elastomer, a compound specially selected for its resistance to moisture and chemicals as well as its ability to stand up under severe wear and tear. Power contacts are of machined copper, silver-plated to reduce contact

resistance. Contact lugs may be either crimped or soldered to cables. The R65 and R68 series are manufactured to MS25488 specifications and are listed on Qualified Product List (QPL) for MIL-C-7974D. Portable receptacles are particularly useful where a portable connection is required or for extending existing

# 3-Pole DC 28V Attachable® Plugs-2 wire

COMPLETE PLUG NO.	MILITARY PART NO.	BODY ONLY PART NO	CABLE ACCOMMODATION	GROMMET KIT NO.	PORT RECEPTA- CLE PART NO.	Schematic
R65G1E	MS25488-25	110368G2E	2-1/0(50mm) MIL-C-5756C Single Conductor	112080G1	R68G1E	
R65G2E	MS25488-26	110368G2E	2-2/0(70mm) MIL-C-5756C Single Conductor	112080G2	R68G2E	
R65G3E	MS25488-27	110368G2E	2-4/0(120mm) MIL-C-5756C Single Conductor	112080G3	R68G3E	
R65G6E		110368G2E	2-4/0(120mm) Oval Twin Conductor	112080G6	R68G6E	<b></b>
R65G8E		110368G2E	2-1/0(35mm) Welding Single Conductor	112080G8	R68G8E	+ 2 3
R65G10E		110368G2E	2-4/0(120mm) Welding Single Conductor	112080G10	R68G10E	_
R65G20E		110368G2E	2-2/0(70mm) Welding Single Conductor	112080G20	R68G20E	
R65G25E		110368G2E	2-3/0 (90mm) welding Single Conductor	112080G25	R68G25E	
R65G43E		110368G2E	#8/2 (8mm) welding Single Jacket	112080G43	R68G43E	

Electrical Ratings:30°C rise Power Components, 450A Continuous 1500A for 1 minute, Control Components, 35A continuous

Other models available for different cable sizes and configurations

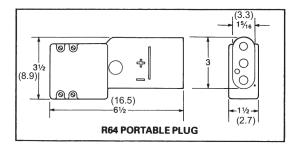
# DC PLUGS ATTACHABLE® 3-POLE

# Attachable® Portable Plugs and Receptacles, R64 and R71Series

The R64 Series are manufactured with MS25488 components but have a more compact design for smaller wires.



**R64 PORTABLE PLUG** 



#### ORDERING INFORMATION

Catalog No. Portable Plug	Cable Accommodation (All MIL-C-5756 Type Cables)	Schematic
R64G1B	Two #2/0 (70mm) and One #12 (3mm) ConductorsUnder Single Oval Sheath	- 1
R64G2B	Two #4/0 (120mm) and One #12 (3mm) ConductorsUnder Single Oval Sheath	+ 2 3
R64G3B	Two #1/0 (50mm) and One #12 (3mm) ConductorsUnder Single Oval Sheath	
R64G3E	Two #1/0 (50mm) Welding Cable Single Conductor	
R64G10E	Two #1/0 (50mm) Welding Single Conductors	+ 2
R64G12E	Two #16 (1.5mm) Welding Cable Single Conductors	

# 3-Pole DC 28V Attachable® Plugs-3 wire; Rect/Oval Nose; Split Control Sensing

The 71 Series are manufactured to MS25487 specifications.

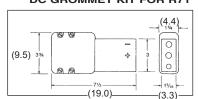


R71 PORTABLE PLUG (R) Rectangular Nose

INTERNAL JUMPER



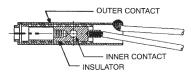
DC GROMMET KIT FOR R71



R71 PORTABLE PLUG "



R71PORTABLE PLUG (O) Oval Nose



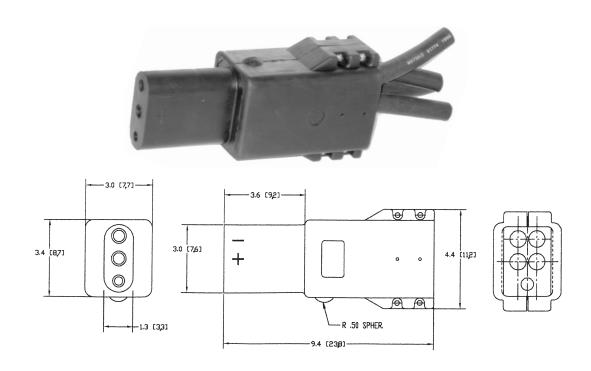
**SENSING LEAD 2 WIRE** 

SENSING LEAD SCHEMATIC R/2				R/1 PORTABLE PLUG "R"		SENSING LEAD 2 WIRE			
Complete Plug No.	Nose R-Rect	Military Part No.	Body Only Part No.	Cable Accomodation	Portable Recept.#	Gromme Kit No.	t Control	Split Schematic	
R71G3E	R		110371G2E	2-4/0 (120mm) TWIN OVAL; #8/1(8mm) AUX.	R78	112085G3	NO	- 11	
R71G4E	R		113071G2E	2-4/0 (120mm) TWIN OVAL; #10/1(5mm) AUX.	R78	112085G4	NO	+ 2 3	
R71G5E	0		113071G2E	2-4/0 (120mm) Mil-C-5756C Single Conductor; #8/1 (8mm)	R78	112085G5	NO	- 1	
R71G6E	R	MS25487-10	113071G2E	2-4/0 (120mm) Mil-C-5756C Single Conductor; #8/1 (8mm) Au	x. R78	112085G6	NO	+ 2 3	
R71G9E	0		113071G2E	2-2/0 (70mm) Welding Single Conductor, #12/2 (2x3mm) Aux.	R78	112085G9	NO	- (1 + (2)	
R71G11E	0		113071G2E	2-2/0 (70mm) Welding Single Conductor, #12/2 (2x3mm) Aux	. R78	112085G11	NO	3 L	
R71G15E	R		113071G2E	2-2/0 (70mm) Mil-C-5756C Single Conductor;; #8/1 (8mm) Aux	k. R78	112085G15	5 NO	SPLIT AUX SENSING	
R72G5E	0		113072G2E	2-4/0 (120mm) Mil-C-5756C Single Conductor; #8/1 (8mm)Auxwith split control, sensing lead lead (1 wire)	x. N/A	112085G5	YES	AUX SWITCH	
R71G5E2S	0		113072G2E	2-4/0 (120mm) Mil-C-5756C Single Conductor; #8/1 (8mm)Au: with split control, sensing lead (ead (2 wire)	x. N/A	112085G5	YES	<b>○</b>  =+ 	





# Attachable® Portable Plugs and Receptacles, 3 Pole, 4, 5, 6 wire. R765 and R771 Series 28 VDC



# 3-Pole DC 28V Attachable® Plugs-4,5,6 wire; Split Control Sensing

Complete Plug No.	Configuration	Body Only Part no.		Grommet Kit No.	Split Control	Portable Receptacle	Schematic
R765G1E (V)	4-wire	110381G2E	4-1/0 (50mm) Mil-C-5756C Single Conductors	112085G1	NO	R768G1E	$\sim$
R765G2E (V)	4-wire	110381G2E	4-2/0 (70mm) Mil-C-5756C Single Conductors	112085G2	NO	R768G2E	+ (1)
R765G3E (V)	4-wire	110381G2E	4-4/0 (120mm) Mil-C-5756C Single Conductors	112085G3	NO	R768G3E	<u> </u>
R771G1E (V)	5-wire	110382G2E	4-1/0 (50mm) Mil-C-5756C Single Conductors; #8(8mm)/1 Aux.	112087G1	NO	R778G1E	
R771G2E (V)	5-wire	110382G2E	4-2/0 70mm) Mil-C-5756C Single Conductors; #8(8mm)/1 Aux.	112087G2	NO	R778G2E	- ⊕-==
R771G3E (V)	5-wire	110382G2E	4-4/0 (120mm) Mil-C-5756C Single Conductors; #8(8mm)/1 Aux.	112087G3	NO	R778G3E	+ 1 2 3
R771G30E (V)	5-wire	113082G2E	4-70mm Single Conductors; #12/2(2x3mm) Aux.	112087G30	NO	R778G30E	
R771G1E(W)(	V) 6-wire	113083G2E	4-1/0 (50mm) Mil-C-5756C Single Conductors;				
			#16/2 (2x1.3mm) Sensing Aux.	112087G1	YES		+ 3
R771G2E(W)(	V) 6-wire	113083G2E	4-2/0 (70mm) Single Conductors; #16/2 (2x1.3mm) Sensing	112087G2	YES		

#### Other Models available for different cable sizes and configurations

W= sensing options V= lug options

S1= one wire 1= solder lugs S2= two wire 2= crimp lugs

SW= sensing switch

SWA= sensing switch and auxiliary

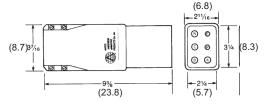
# AC PLUG ATTACHABLE® 6-POLE

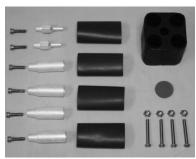


# AC 115/200 VOLTS 400 Hz Attachable® Portable Plugs and Receptacles, 6 Pole, R67 and R112 Series



**R67 PORTABLE PLUG** 

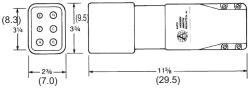




R67 GROMMET "G"KIT



**R112 PORTABLE RECEPTACLE** 



The ATTACHABLE® Portable Plugs and Receptacles are molded of Anderson Synthetic Elastomer\*, a proprietary compound specially selected for its resistance to moisture and chemicals as well as its ability to stand up under severe wear and tear. Power contacts are silver-plated over machined copper to reduce contact resistance. Contact lugs may be either crimped or soldered to cables. The ATTACHABLE® Plugs and Receptacles are manufactured to MS25486 specifications and are listed on Qualified Product List (QPL) for MIL-C-7974. (AS 7974)

The R67 series plugs mate with either the R112 series of Portable Receptacles or with the fixed receptacles. Portable Receptacles are particularly useful where a portable connection is required or for extending existing cable assemblies.

Six-pole ATTACHABLE Portable Plugs and Receptacles may be furnished in many combinations of power and control contacts, cable sizes and internal wiring arrangements.

### 6-Pole AC 115/200V 400Hz Attachable® Plugs

Complete Plug No.	Military Part No.	Body Only Part no.	Cable Accomodation	Grommet Kit No.	Portable Receptacle Part No.
R67G4E	MS25486-16	110369G4E	4-1/0 (50mm) Mil-C-5756C Single Conductor	112081G4	R112G4E
R67G5E	MS25486-30	110369G4E	4-1/0 (50mm) Mil-C-5756C Single Conductor; 12/2 (2x3mm)Aux	. 112081G5	R112G5E
R67G7E		110369G4E	4-2/0 (70mm) Welding Single Conductor	112081G7	R112G7E
R67G12E		110369G4E	4-#4 (20mm) Welding Single Conductor; 12/2 (2x3mm)Aux.	112081G12	R112G12E
R67G16E		110369G4E	4-#6 (13mm) Welding Single Conductor; 12/2 (2x3mm)Aux.	112081G16	R112G16E
R67G18E		110382G4E	4-#2 (34mm) Welding Multiconductor	112081G18	R112G18E
R67G20E		110369G4E	4-2/0 (70mm) Welding Single Conductor; 12/2 (2x3mm)Aux.	112081G20	R112G20E
R67G21E	MS25486-17	110369G4E	4-2/0 (70mm) Mil-C-5756C Single Conductor	112081G21	R112G21E
R67G26E		110369G4E	3-#3 (27mm) 1#5 (17mm) CVSF Multiconductor	112081G26	R112G26E
R67G36E	MS25486-31	110369G4E	4-2/0 (70mm) Mil-C-5756C Single Conductor; 12/2 (2x3mm)Aux	. 112081G36	R112G36E
R67G56E		110369G4E	4-1/0 (50mm) Welding Single Conductor; 12/2 (2x3mm)Aux.	112081G56	R112G56E
R67G82E		110369G4E	4-1/0 (50mm) Single Conductor; (2x2.5mm) Aux.	112081G82	R112G82E
R67G91E		110369G4E	3-1/0 (50mm) 3-#6 (13mm) Command Multiconductor	112081G91	R112G91E
R67G100E	Voltage Sensing	110369GE	4-2/0 (70mm) : 12/5 (5x3mm) Aux.	112081G100	R112G100E
R67G103E		110369G4E	6-#4 (20mm) 1-1/0 (50mm) 6x1 Composite	112081G101	R112G101E

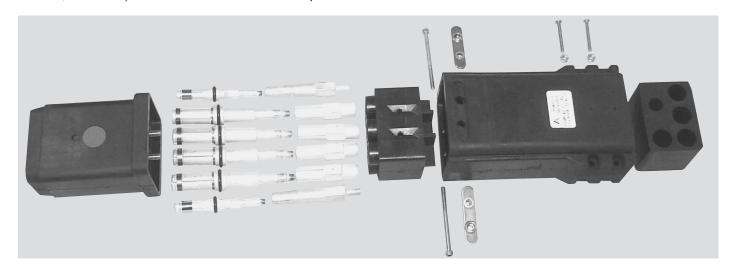
Other Models available for different cable sizes and configurations ®Attachable is a Registered Trademark of Anderson Airmotive

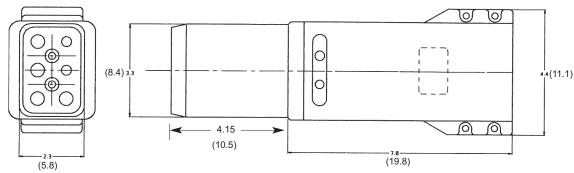
# AC PLUG ATTACHABLE®POWER NOSE 6-POLE DC PLUG ATTACHABLE®POWER NOSE 3-POLE

# Attachable Power Nose® (APN) R90: Rubber

The Attachable® Power Nose is designed to be the quickest assembly and lowest overall service ground power connector. The modular construction allows easy replacement of worn components (contacts, nose, back end) for extended service life and quick

repair. The body and nose are molded from the proprietary synthetic elastomer known for its excellent abrasion resistance. Suitable for composite cables as well as single conductors.





# 6-Pole 115/200V 400Hz Attachable® Power Nose (APN) R90

Complete	Replacement	Cable	Replacement
Plug No.	Nose only	Accommodation	Contact Kit
R90G5E R90G36E R90G101E R90G118E	R90KIT 1 R90KIT 1 R90KIT 1 R90KIT 1 R90KIT1SW	4-1/0 (50mm) MIL-C-5756C Single Conductors; #12/2 (2x3mm) Aux. 4-2/0 (70mm) MIL-C-5756C Single Conductors; #12/2 (2x3mm) Aux. 6 #4 (20mm), 1-1/0 (50mm) Multiconductor; 6X1 Single Jacket 4-70mm Single Conductors; #12/2 (2x3mm) Aux Replacement Nose with Microswitch	R90 Kit 2 Power R90 Kit 3 Aux

# 3-Pole 28V DC Attachable® Power Nose (APN) R93

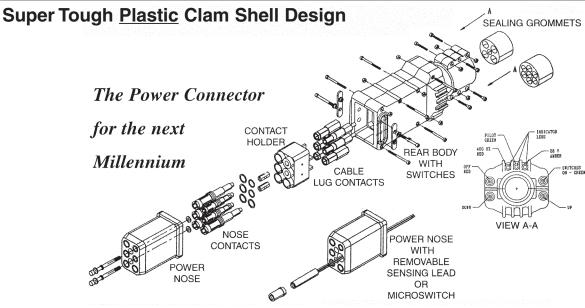
Complete Plug No.	Replacement Nose only	Cable Accommodation
R93G3E		2-4/0 (120mm) MIL-C-5756C Single Conductors Replacement Nose with Microswitch

Other Models available for different cable sizes and configurations Other kits available. Contact factory.



Replacement Contact Kit R93 Kit 2 Power R93 Kit 3 Aux

# AC PLUG ATTACHABLE POWER NOSE® APN 6-POLE DC APN 3-POLE with switches & LEDs





Quick, easy assembly of all components; Triple sealed against moisture intrusion

Modular Components can be replaced quickly at the ramp:

- · High abrasion resistant special rubber nose
- Rugged service proven long life Grabber® Contacts
- On-off; in-out waterproof switches with Waterproof LED status indicators
  - Waterproof sensing lead or microswitch available see page 28
  - · Super tough clam shell with stainless hardware

# 6-Pole 115/200V 400Hz Attachable® Power Nose (APN) R91

Complete	Replacement	Cable	Replacement
Plug No.	Nose only	Accommodation	Contact Kit
R91G5E R91G36E R91G101E R91G118E R91G146E	R91KIT 1 R91KIT 1 R91KIT 1 R91KIT 1 R91KIT 1	4-1/0 (50mm) MIL-C-5756C Single Conductors;; #12/2 (2x3mm) Aux. 4-2/0 (70mm) MIL-C-5756C Single conductors;; #12/2 (2x3mm) Aux. 6 #4 (20mm), 1-1/0 (50mm) Multiconductor; 6X1 Single Jacket 4-70mm Single Conductors; #12/2 (2x3mm) Aux 3-70mm Cables W Neutral	R91 Kit 2 Power R91 Kit 3 Aux

# 3 Pole 28V DC Attachable® Power Nose (APN) R92

R92G3E	R92KIT 1	2-4/0(120mm) Single Conductors
R92G153 R92G154	R92KIT 1 R92KIT 1	2-4/0(70mm) Single Conductors 2-4/0(70mm) Single Conductors

Other Models available for different cable sizes and configurations Other kits available contact factory.



R91 CLAMSHELL 3 CONDUCTOR

R92 Kit 2 Power R92 Kit 3 Aux R92 Kit 2 Power R92 Kit 2 Power

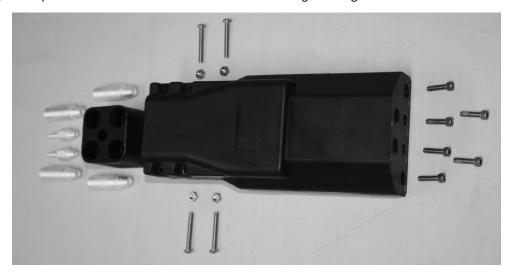
# AC PLUG ATTACHABLE® 230/400 VAC



# **B1B Bomber Military Aircraft Connector**

The ATTACHABLE Portable Plugs and Receptacles are molded of a proprietary synthetic elastomer, a compound specially selected for its resistance to moisture and chemicals as well as its ability to stand up under severe wear and tear. Power contacts are of machined copper, silver-plated to reduce contact

resistance. Contact lugs may be either crimped or soldered to cables. The R129 and R130 series are manufactured to MS21378 specifications and tested per MIL-C-7974D. Portable receptacles are particularly useful where a portable connection is required or for extending existing cable assemblies.



# 6-Pole AC 230/400V 400Hz Attachable® Plugs

Complete Plug No.	Military Part No.	Body Only Part no.	Cable Accomodation	Grommet Kit No.	Portable Receptacle Part No.
R129G4E		3-4991G1	4-1/0 (50mm) Mil-C-5756C Single Conductor	112081G4	R130G4E
R129G5E-50A	MS21378	3-4991G1	4-1/0 (50mm) Mil-C-5756C Single Conductor; 12/2 (2x3mm)Aux.	112081G5	R130G5E
R129G7E		3-4991G1	4-2/0 (70mm) Welding Single Conductor	112081G7	R130G7E
R129G12E		3-4991G1	4-#4 (20mm) Welding Single Conductor; 12/2 (2x3mm)Aux.	112081G12	R130G12E
R129G16E		3-4991G1	4-#6 (13mm) Welding Single Conductor; 12/2 (2x3mm)Aux.	112081G16	R130G16E
R129G18E		3-4991G1	4-#2 (33mm) Welding Multiconductor	112081G18	R130G18E
R129G20E		3-4991G1	4-2/0 (50mm) Welding Single Conductor; 12/2 (2x3mm)Aux.	112081G20	R130G20E
R129G21E		3-4991G1	4-2/0 (50mm) Mil-C-5756C Single Conductor	112081G21	R130G21E
R129G26E		3-4991G1	3-#3 (27mm) 1#5(17mm) CVSF Multiconductor	112081G26	R130G26E
R129G36E		3-4991G1	4-2/0 (70mm) Mil-C-5756C Single Conductor; 12/2 (2x3mm)Aux.	112081G36	R130G36E
R129G56E		3-4991G1	4 (50mm) Welding Single Conductor; 12/2 (2x3mm)Aux.	112081G56	R130G56E
R129G82E		3-4991G1	4 (50mm) Single Conductor; 2.5mm/2Aux.	112081G82	R130G82E
R129G91E		3-4991G1	3-1/0 (50mm) 3-#6 (13mm) Command Multiconductor	112081G91	R130G91E
R129G100E		3-4991G1	4-2/0 (70mm) : 12/5 (5x3mm) Aux	112081G100	R130G100E
R129G103E		3-4991G1	6-#4 (20mm) 1-1/0 (50mm) 6x1 Multiconductor	112081G101	R130G101E

Other Models available for different cable sizes and configurations ®Attachable is a Registered Trademark of Anderson Airmotive

# The Anderson Family Ground Power Cable Assemblies



# Attachable®and Over Molded Cable Assemblies

Cable assemblies are fabricated to the exacting requirements of MIL-C-7974D. Anderson Airmotive Products is a qualified source of supply for MS25019, MS90328, MS21378, and MS90347 assemblies.

In addition, Anderson can supply special cable configurations or lengths to meet your requirements. Contact the factory or your local Authorized Distributor for additional information.

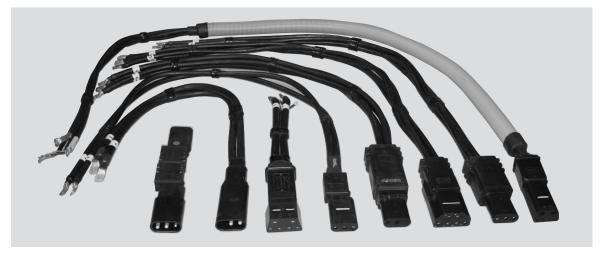
All Anderson cable assemblies feature silver plated high conductivity contacts with finger proof safety insulators and cable qualified to the latest military specification MIL-C-5756C; Composite Cables are UL listed. All these features insure that our cable assemblies are the safest, most flexible and longest lasting cable assemblies available today.

Our family of power cables is unequaled in the industry. Anderson Airmotive is the only company to offer you a choice of:

- (1) making/repairing your own ground power cables with our family of high quality and durable Attachable ®plugs, or
- (2) buying a wide variety of new cable assemblies with either Attachable® or Overmolded plugs, from the factory.



AC output cable assemblies from 110/200 VAC and 230/400VAC to 600V input cable assemblies with quick change noses, modular components and many cable options.

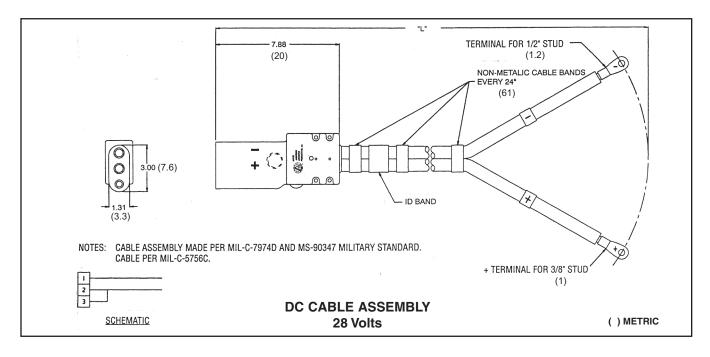


DC output cable assemblies from 28VDC, 80VDC and 270VDC with quick change noses and many cable options.

# DC AIRCRAFT GROUND POWER CABLE ASSEMBLIES 3-POLE



# 2 Wire R65 28V DC



PART NUMBER	LENGTH FEET/METERS	MILITARY PART NO.	CABLE DESCRIPTION	WEIGHT LBS (KG)	ASSEMBLY CONFIGURATION
R65G1E-20AorM	20 (6)	MS90347-7AorM	2-1/0 (50mm) AWG SINGLE	26 (12)	+ R
R65G1E-30AorM	30 (9)	MS90347-8AorM	CONDUCTORS,	36 (16)	
R65G1E-40AorM	40 (12)	MS90347-9AorM	NO CONTROL LEAD,	46 (21)	
R65G1E-60AorM	60 (18)	MS90347-10AorM	SILVERPLATED	67 (30)	
R65G1E-80AorM	80 (24)	MS90347-11AorM	CONTACTS, AND	87 (40)	
R65G1E-100AorM	100 (30)	MS90347-12AorM	NON-METALLIC BANDS	107 (49)	
R65G1E-2AorM	2 (0.7)	MS90347-25AorM	SPLICE KIT	7 (3)	
R65G2E-20AorM	20 (6)	MS90347-13AAorM	2-2/0 (70mm) AWG SINGLE	32 (15)	
R65G2E-30AorM	30 (9)	MS90347-14AAorM	CONDUCTORS,	45 (21)	
R65G2E-40AorM	40 (12)	MS90347-15AAorM	NO CONTROL LEAD,	58 (26)	
R65G2E-60AorM	60 (18)	MS90347-16AAorM	SILVERPLATED	84 (38)	
R65G2E-80AorM	80 (24)	MS90347-17AAorM	CONTACTS, AND	110 (50)	
R65G2E-100AorM	100 (30)	MS90347-18AAorM	NON-METALLIC BANDS	136 (67)	
R65G2E-2AorM	2 (0.7)	MS90347-26AorM	SPLICE KIT	8 (4)	
R65G3E-20AorM R65G3E-30AorM R65G3E-40AorM R65G3E-60AorM R65G3E-80AorM R65G3E-100AorM R65G3E-2AorM	20 (6) 30 (9) 40 (12) 60 (18) 80 (24) 100 (30) 2 (0.7)	MS90347-19AAorM MS90347-20AAorM MS90347-21AAorM MS90347-22AAorM MS90347-23AAorM MS90347-24AAorM	2-4/0 (120mm) AWG SINGLE CONDUCTORS, NO CONTROL LEAD, SILVERPLATED CONTACTS, AND NON-METALLIC BANDS SPLICE KIT	45 (20) 65 (29) 84 (38) 123 (56) 162 (74) 201 (91) 9 (4)	

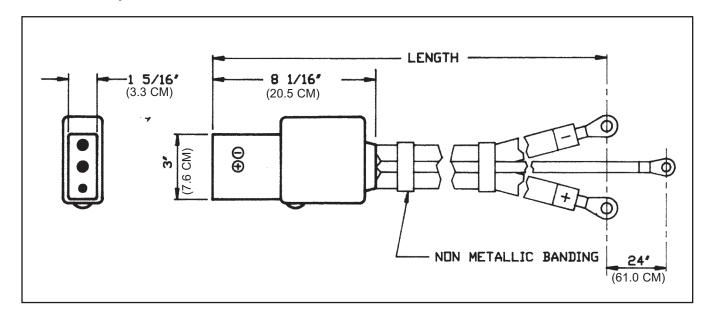
Cable assemblies are available with Attachable® plug types as well as integrally Over Molded connectors. Other assemblies available for different cable sizes and configurations

A= Attachable® Head
M =Over Molded Head

# DC AIRCRAFT GROUND POWER CABLE ASSEMBLIES 3-POLE



# 3 Wire R71, R72



PART NUMBER	LENGTH FEET/METERS	MILITARY PART NO.	CABLE DESCRIPTION	WEIGHT LBS (KG)	ASSEMBLY CONFIGURATION
R71G6E-20AorM R71G6E-30AorM R71G6E-40AorM R71G6E-60AorM R71G6E-80AorM R71G6E-100AorM R71G6E-2AorM	20 (6) 30 (9) 40 (12) 60 (18) 80 (24) 100 (30) 2 (0.7)	MS25019-20A, M MS25019-30A, M MS25019-40A, M MS25019-60A, M MS25019-80A, M MS25019-100A, M MS25019-2AorM	CONDUCTORS, #8 CONTROL LEAD, SILVERPLATED CONTACTS, AND NON-METALLIC BANDS	46 (21) 66 (30) 85 (39) 124 (57) 162 (74) 202 (92) 10 (4)	+ +
R71G5E-20AorM R71G5E-30AorM R71G5E-40AorM R71G5E-60AorM R71G5E-80AorM R71G5E-100AorM R71G5E-2AorM	20 (6) 30 (9) 40 (12) 60 (18) 80 (24) 100 (30) 2 (0.7)		2-4/0 (120mm) AWG SINGLE CONDUCTORS, #8 CONTROL LEAD, SILVERPLATED CONTACTS, AND NON-METALLIC BANDS SPLICE KIT	46 (21) 66 (30) 85 (39) 124 (57) 162 (74) 202 (92) 10 (4)	OVAL
R72G5E-20AorM R72G5E-30AorM R72G5E-40AorM R72G5E-60AorM R72G5E-80AorM R72G5E-100AorM R72G5E2S-2AorM	20 (6) 30 (9) 40 (12) 60 (18) 80 (24) 100 (30) 2 (6)		2-4/0 (120mm) AWG SINGLE CONDUCTORS, #8 CONTROL LEAD, SENSING SILVERPLATED CONTACTS, AND NON-METALLIC BANDS 2 WIRE SENSING LEAD	46 (21) 66 (30) 85 (39) 124 (57) 162 (74) 202 (92) 10 (4)	SSUT AIX SSUSSAGE + OVAL

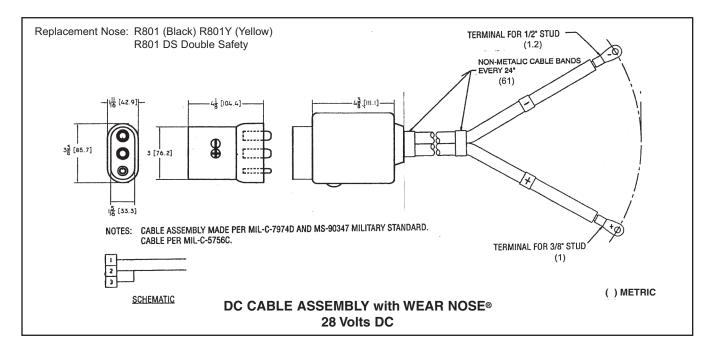
 $Cable\ assemblies\ are\ available\ with\ Attachable^{\circledast}\ plug\ types\ as\ well\ as\ integrally\ Over\ Molded\ connectors.$  Other assemblies\ available\ for\ different\ cable\ sizes\ and\ configurations

A= Attachable® Head
M =Over Molded Head

# DC AIRCRAFT GROUND POWER CABLE ASSEMBLIES 3-POLE



# 2 Wire R800 28V DC Wear Nose®



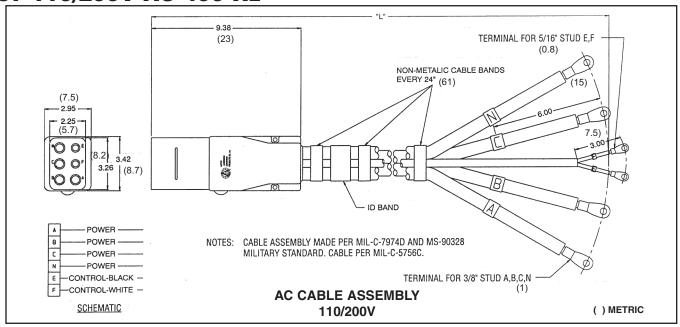
PART NUMBER	LENGTH FEET/METERS	MILITARY PART NO.	CABLE DESCRIPTION	WEIGHT LBS (KG)	ASSEMBLY CONFIGURATION
R800G1E-20M R800G1E-30M R800G1E-40M R800G1E-60M R800G1E-80M R800G1E-100M R800G1E-2AM	20 (6) 30 (9) 40 (12) 60 (18) 80 (24) 100 (30) 2 (0.7)	MS90347-7AorM MS90347-8AorM MS90347-9AorM MS90347-10AorM MS90347-11AorM MS90347-12AorM MS90347-25AorM	2-1/0 (50mm) AWG SINGLE CONDUCTORS, NO CONTROL LEAD, SILVERPLATED CONTACTS, AND NON-METALLIC BANDS SPLICE KIT	26 (12) 36 (16) 46 (21) 67 (30) 87 (40) 107 (49) 7 (3)	+ R
R800G2E-20M R800G2E-30M R800G2E-40M R800G2E-60M R800G2E-80M R800G2E-100M R800G2E-2M	20 (6) 30 (9) 40 (12) 60 (18) 80 (24) 100 (30) 2 (0.7)	MS90347-13AAorM MS90347-14AAorM MS90347-15AAorM MS90347-16AAorM MS90347-17AAorM MS90347-18AAorM MS90347-26AorM	2-2/0 (70mm) AWG SINGLE CONDUCTORS, NO CONTROL LEAD, SILVERPLATED CONTACTS, AND NON-METALLIC BANDS SPLICE KIT	32 (15) 45 (21) 58 (26) 84 (38) 110 (50) 136 (67) 8 (4)	
R800G3E-20M R800G3E-30M R800G3E-40M R800G3E-60M R800G3E-80M R800G3E-100M R800G3E-2M	20 (6) 30 (9) 40 (12) 60 (18) 80 (24) 100 (30) 2 (0.7)	MS90347-19AAorM MS90347-20AAorM MS90347-21AAorM MS90347-22AAorM MS90347-23AAorM MS90347-24AAorM	2-4/0 (120mm) AWG SINGLE CONDUCTORS, NO CONTROL LEAD, SILVERPLATED CONTACTS, AND NON-METALLIC BANDS SPLICE KIT	45 (20) 65 (29) 84 (38) 123 (56) 162 (74) 201 (91) 9 (4)	

Other assemblies available for different cable sizes and configurations

# AC AIRCRAFT GROUND POWER CABLE ASSEMBLIES 6-POLE



# R67 110/200V AC 400 Hz



A= Attachalbe M = Overmolded.

PART NUMBER	LENGTH FEET/ METERS	MILITARY PART NO.	CABLE DESCRIPTION	WEIGHT LBS (KG)	ASSEMBLY CONFIGURATION
R67G4E-20AorM R67G4E-30AorM R67G4E-40AorM R67G4E-60AorM R67G4E-80AorM R67G4E-100AorM R67G4E-2AorM	20 (6) 30 (9) 40 (12) 60 (18) 80 (24) 100 (30) 2 (.7)	MS90328-13AorM MS90328-14AorM MS90328-15AorM MS90328-16AorM MS90328-17AorM MS90328-18AorM MS90328-39AorM	4-1/0 (50mm) AWG SINGLE CONDUCTORS, NO CONTROL LEADS, E AND F SHUNTED IN PLUG, SILVER PLATED CONTACTS, AND NON-METALLIC BANDS SPLICE KITS	46 (21) 67 (30) 87 (39) 127 (58) 168 (76) 208 (94) 10 (5)	A B C N E F
R67G21E-20AorM R67G21E-30AorM R67G21E-40AorM R67G21E-60AorM R67G21E-80AorM R67G21E-100AorM R67G21E-2AorM	20 (6) 30 (9) 40 (12) 60 (18) 80 (24) 100 (30 2 (.7)	MS90328-19AorM MS90328-20AorM MS90328-21AorM MS90328-22AorM MS90328-23AorM MS90328-24AorM MS90328-40AorM	4-2/0 (70mm) AWG SINGLE CONDUCTORS, NO CONTROL LEADS, E AND F SHUNTED IN PLUG, SILVER PLATED CONTACTS, AND NON-METALLIC BANDS SPLICE KITS	60 (27) 88 (40) 116 (53) 172 (78) 226 (103) 281 (127) 12 (5)	
R67G5E-20AorM R67G5E-30AorM R67G5E-40AorM R67G5E-60AorM R67G5E-80AorM R67G5E-100AorM R67G5E-2AorM	20 (6) 30 (9) 40 (12) 60 (18) 80 (24) 100 (30 2 (.7)	MS90328-25AorM MS90328-26AorM MS90328-27AorM MS90328-28AorM MS90328-29AorM MS90328-30AorM MS90328-37AorM	4-1/0(50mm) AWG SINGLE CONDUCTORS, 1-12/2 (2X3mm) CONTROL LEAD, SILVER PLATED CONTACTS, AND NON-METALLIC BANDS	50 (23) 71 (32) 93 (42) 137 (62) 180 (22) 224 (102) 9 (4)	A B C Z W F
R67G36E-20AorM R67G36E-30AorM R67G36E-40AorM R67G36E-60AorM R67G36E-80AorM R67G36E-100AorM R67G36E-2AorM	20 (6) 30 (9) 40 (12) 60 (18) 80 (24) 100 (30) 2 (.7)	MS90328-31AorM MS90328-32AorM MS90328-33AorM MS90328-34AorM MS90328-35AorM MS90328-36AorM MS90328-38AorM	4-2/0 (70mm) AWG SINGLE CONDUCTORS, 1-12/2 (2X3mm) CONTROL LEADS, SILVER PLATED CONTACTS, AND NON-METALLIC BANDS  SPLICE KITS	58 (26) 84 (38) 110 (50) 162 (78) 213 (97) 297 (135) 9(4)	

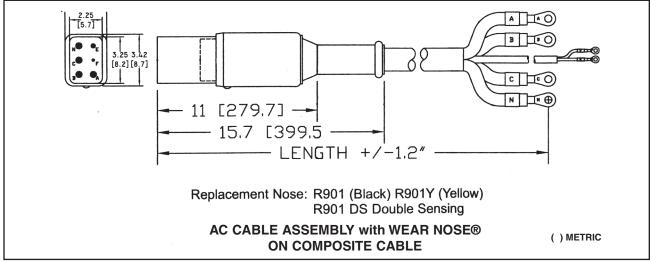
Cable assemblies are available with Attachable® plug types as well as Over Molded connectors for any type of cable including single jacket composite cables. Other assemblies available for different cable sizes and configurations.

# AC AIRCRAFT GROUND POWER CABLE ASSEMBLIES 6-POLE



# R900 110/200V AC with Wear Nose®

Cable assembly with over molded plug and field replaceable nose. Compatible with other wear nose type assemblies.



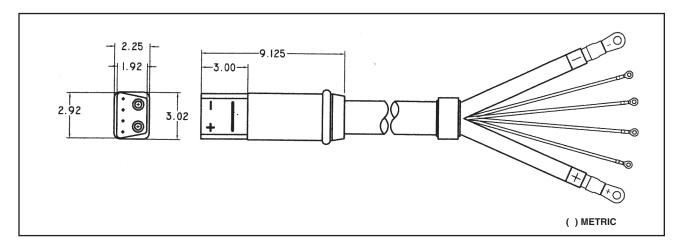
PART NUMBER	LENGTH FEET/ METERS	CABLE DESCRIPTION	WEIGHT LBS (KG)	ASSEMBLY CONFIGURATION
R900G4E-20M R900G4E-30M R900G4E-40M R900G4E-60M R900G4E-80M R900G4E-100M R900G4E-2M	20 (6) 30 (9) 40 (12) 60 (18) 80 (24) 100 (30)	4-1/0 (50mm) AWG SINGLE CONDUCTORS, NO CONTROL LEADS, E AND F SHUNTED IN PLUG, SILVER PLATED CONTACTS, AND NON-METALLIC BANDS	46 (21) 67 (30) 87 (39) 127 (58) 168 (76) 208 (94) 10 (5)	A B C N E F
R900G4E-2M R900G21E-20M	2 (.7)	SPLICE KITS 4-2/0 (70mm) AWG SINGLE CONDUCTORS,	60 (27)	
R900G21E-30M R900G21E-40M R900G21E-60M R900G21E-80M R900G21E-100M	30 (9) 40 (12) 60 (18) 80 (24) 100 (30	NO CÒNTRÓL LEADS, E AND F SHUNTED IN PLUG, SILVER PLATED CONTACTS, AND NON-METALLIC BANDS	88 (40) 116 (53) 172 (78) 226 (103) 281 (127)	
R900G21E-2M	2 (.7)	SPLICE KITS	12 (5)	
R900G5E-20M R900G5E-30M R900G5E-40M R900G5E-60M R900G5E-80M R900G5E-100M	20 (6) 30 (9) 40 (12) 60 (18) 80 (24) 100 (30	4-1/0(50mm) AWG SINGLE CONDUCTORS, 1-12/2 (2X3mm) CONTROL LEAD, SILVER PLATED CONTACTS, AND NON-METALLIC BANDS	50 (23) 71 (32) 93 (42) 137 (62) 180 (22) 224 (102)	A B C N E F
R900G5E-2M	2 (.7)	SPLICE KITS	9 (4)	
R900G36E-20M R900G36E-30M R900G36E-40M R900G36E-60M R900G36E-80M R900G36E-100M	20 (6) 30 (9) 40 (12) 60 (18) 80 (24) 100 (30)	4-2/0 (70mm) AWG SINGLE CONDUCTORS, 1-12/2 (2X3mm) CONTROL LEADS, SILVER PLATED CONTACTS, AND NON-METALLIC BANDS	58 (26) 84 (38) 110 (50) 162 (78) 213 (97) 297 (135)	
R900G36E-2M	2 (.7)	SPLICE KITS	9(4)	
R900G103E-20M R900G103E-30M R900G103E-40M R900G103E-60M R900G103E-80M R900G103E-100M R900G103E-3M	20 (6) 30 (9) 40 (12) 60 (18) 80 (24) 100 (30) 3 (1)	6 #4 AWG (20mm); 1 #1 (42 mm) COMPOSITE CABLE 6 #4 AWG (20mm); 1 #1 (42 mm) COMPOSITE CABLE 6 #4 AWG (20mm); 1 #1 (42 mm) COMPOSITE CABLE 6 #4 AWG (20mm); 1 #1 (42 mm) COMPOSITE CABLE 6 #4 AWG (20mm); 1 #1 (42 mm) COMPOSITE CABLE 6 #4 AWG (20mm); 1 #1 (42 mm) COMPOSITE CABLE 6 #4 AWG (20mm); 1 #1 (42 mm) COMPOSITE CABLE	50 (23) 70 (32) 90 (41) 130 (59) 170 (77) 210 (95)	Ø000 Ø1.65
11300G 103E-3W	3(1)	10 #4 AVVO (2011111), 1 #1 (42 11111) CONIF CONTE CABLE	10(1)	

# AC AIRCRAFT GROUND POWER CABLE ASSEMBLIES



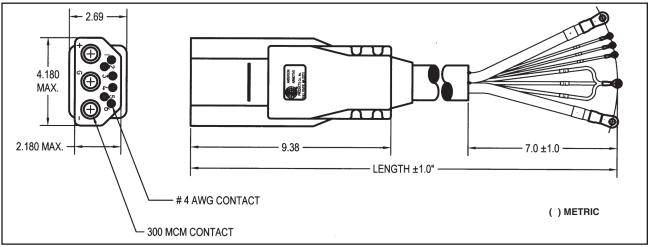
# **FAST CHARGE 80V®**

Type A: 2 Power Leads and 4 Auxiliaries



PART NUMBER	LENGTH FEET/ METERS	CABLE DESCRIPTION	WEIGHT LBS (KG)	ASSEMBLY CONFIGURATION
R270G5E-20M R270G36E-20M	\ ,	2 1/0 (50mm) and 4 #12 (3mm) AWG MILC5756B 2 2/0 (50mm) and 4 #12 (3mm) AWG MILC5756B	55 (25) 65 (30)	• • •

Type B: 2 Power Leads 1 Ground and 6 Auxiliaries



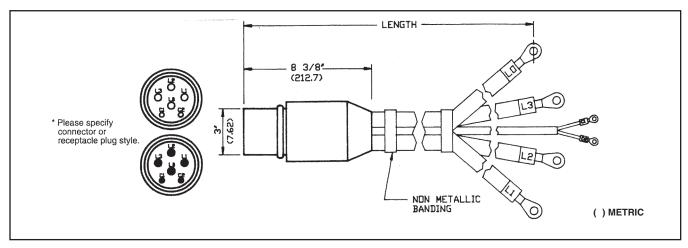
A= Attachalbe M = Overmolded.

PART NUMBER	LENGTH FEET/ METERS	CABLE DESCRIPTION	WEIGHT LBS (KG)	ASSEMBLY CONFIGURATION
R80G103E-XXM	AS REQUIRED	COMPOSITE CABLE WITH 2 4/0 AWG (100mm); 3 #6 AWG (13mm); 3 #16 AWG (1.3mm); 6#22 AWG (0.45mm)	2.3lbs (1 kg) per foot	CONNECTOR    BLACK #4/0 AWG   BLACK #4/0 AWG

# AC AIRCRAFT GROUND POWER CABLE ASSEMBLIES 6-POLE



# RAMP POWER 416/240V



The Ramp Power Connector is used on a variety of military and commercial ground service equipment around the world. The neoprene body and silver-plated contacts provide for a safe, reliable connection that is not only moisture and corrosion-resistant, but able to withstand the real-life abuse of everyday usage on the ramp. Accomodates wire sizes from #4 AWG to 4/0 AWG.

G.A.P.P. P/N	LENGTH FEET	LENGTH METERS	CONDUCTOR NO. AND SIZE	SHIP. WT (LBS)	CABLE, BAND & SCHEMATIC
MALE 833N005020 833N005030 833N005040 833N005060 833N005080 833N005100	20 30 40 60 80 100	6.10 9.14 12.19 18.29 24.38 30.48	(4) 1/0, (50mm) (2x3mm) (4) 1/0, (50mm) (2x3mm)	46 67 87 127 168 208	20 00 00 00 00 00 00 00 00 00 00 00 00 0
833N036020 833N036030 833N036040 833N036060 833N036080 833N036100	20 30 40 60 80 100	6.10 9.14 12.19 18.29 24.38 30.48	(4) 2/0, (70mm) (2x3mm) (4) 2/0, (70mm) (2x3mm)	56 84 110 162 213 265	
FEMALE 834N005020 834N005030 834N005040 834N005060 834N005080 834N005100	20 30 40 60 80 100	6.10 9.14 12.19 18.29 24.38 30.48	(4) 1/0, (50mm) (2x3mm) (4) 1/0, (50mm) (2x3mm)	50 71 93 137 180 224	L1
834N036020 834N036030 834N036040 834N036060 834N036080 834N036100	20 30 40 60 80 100	6.10 9.14 12.19 18.29 24.38 30.48	(4) 2/0, (70mm) (2x3mm) (4) 2/0, (70mm) (2x3mm)	60 88 116 172 226 281	

Other lenghts available upon request

Applications include: Hydraulic test stands, motor generators, air conditioning units, 400Hz Frequency Converters

# THE ANDERSON FAMILY RECEPTACLES

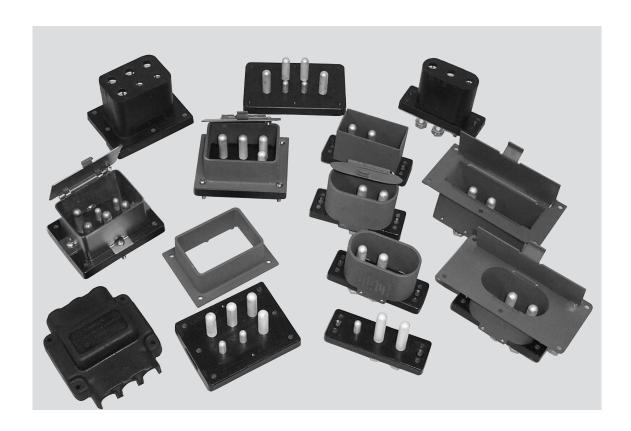


Ground Power Receptacles are located on the aircraft or other devices and receive the power input from a ground source to recharge and operate electrical accessories. Anderson offers the largest selection of receptacles ranging from 28V DC to 270V DC and 110V AC to 400V AC accommodating all your power needs. Varieties include male and female designs.

Anderson Airmotive DC and AC receptacles are manufactured to specification MIL-C-81790 and are listed on the Qualified Products List. Bases are molded of glass reinforced material for low moisture absorption and high strength. The copper power and brass control contacts are machined and silverplated to MS

tolerances.

The shield, when applicable, is of anodized aluminum to guide plug insertion and guard against misalignment. Studs and contact nuts for lug connections are located at the rear of the receptacle.



# Receptacle Performance to QPL MIL-C-81790 (AS81790)

Dielectric Withstand 2500VRMS WITH< 1 milli-amp leakage

Current Rating - Power Contacts 450A continuous (> than 1 hour) 1500A for 1 minute

Current Rating - Control Contacts 35A continuous auxiliary
Flexural Strength 3500 lbs (1590 Kg)

Thermal Shock -65° to +200°C

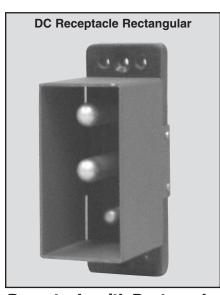
Impact Strength - Power Contacts Withstands impact of 10 lb weight (4.5KG) dropped from 24 inches (60 cm) Impact Strength - Control Contacts Withstands impact of 10 lb weight (4.5KG) dropped from 12 inches (30 cm)

# **GROUND POWER RECEPTACLES (3-POLE) 28V DC**

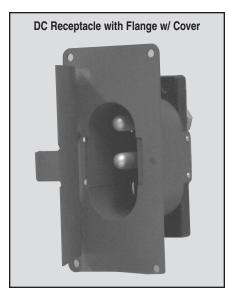




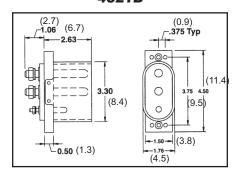
Receptacle with Oval Shield MS 3506-1 4621B

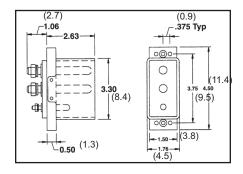


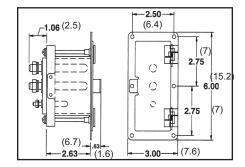
Receptacle with Rectangular Shield MS 25018-2 4632B



Receptacle with Oval Shield and Cover 4650B







Description	Anderson Catalog Number	Government Reference Number	Mating Plug & Cable Assemblies
Receptacle	4622B		Series R64 Plug
Receptacle w/Oval Shield	4621B	MS3506-1	Series R65 (MS25488)
Receptacle w/Oval Shield and Snap Cover	4621BSC		Series R71, R92
Receptacle w/Oval Shield and Flanged Cover	4650B	MS90362-1	(MS93047) Cable Assembly
Receptacle with Rectangular Shield	4632B	<del></del>	Series R71 Plug (MS25487)
Receptacle w/Rectangular Shield & Flanged Cover	4651B	MS25018-2	(MS25019) Cable Assembly R765, R771, R93
Female Receptacle	4665B		Series R68



4665B



4621B





4651B

4621BSC

# Ground Power RECEPTACLES (6-POLE) 115/200V AC 400Hz









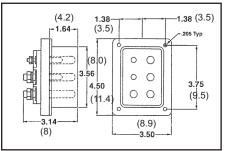


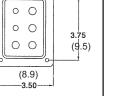
Receptacle MS90302-3 4627B

Shield MS17845-1 4654B

Rear Cover MS3505-1 4633B

Snap Cover 4652G2B





(5.7)(13)2.25 5.13 -1.75 (4.4) **@** 0 0 0 0 3.00 (7.6) 0 0

(5.7)(5.3)-2.25 -1.75+ (11.4 **@** 

Receptacle with Shield Receptacle with Shield and Rear Cover

Receptacle with Rear Cover and Snap Cover

400 Hz Receptacles are designed to meet specifications for Connector Style 3A as detailed in ISO461/1 AND ISO461/2, and US Military Specification MIL-C-81790 (A) and are listed on Qualified Product List (QPL)

Description	Anderson Catalog Number	Government Reference Number	Mating Plug & Cable Assemblies
Receptacle Only	4627B	MS90362-3	
Receptacle w/Rear Cover and Shield	4628B	MS90362-4	Series R67 Plug
Receptacle w/Shield and Fine Thread Terminals	4631B	MS90362-1	(MS25486)
Rear Cover Only	4633B	MS3505-1	and
Shield Only	4654B	MS17845-1	Cable Assembly
Receptacle w/Rear Cover, Shield and Hinged Snap Front Cover	4652B		MS90328
Hinged Snap Cover Steel Shield Hinged Snap Cover Aluminum Shield	4652G2 4652G2B		Series R90, R91
Female Receptacle	4667B		Series R112

Power Terminal Studs have 3/8 - 24 thread. Control terminal studs have 10-32 N.F. thread. All dimensions are in inches and centemeters for reference only; they should not be used for layout work. Specific details will be furnished on request.









4628B 4631B 4652G2 4667B

# 80 VDC Fast Charge; 230/400V AC RECEPTACLES



# 80 VDC Fast Charge; 270 VDC

Ground Power Receptacles are located on the aircraft or other devices and receive the power input from a ground source to recharge and operate electrical accessories. Anderson offers the largest selection of receptacles ranging from 28V DC to 270V DC and 110V AC to 400V AC accommodating all your power needs.



Receptacle 3-8358P1



Receptacle with Shield 4629B

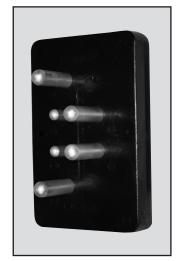


Shield 2-8356P1



Rear Cover 4634B

# 230/400V AC Receptacle



Receptacle 3-4985G1



Receptacle with Shield MS21379



Shield 2-6976P1



Snap Cover 2-6976P1SC

# ANDERSON ATTACHABLE® AC HANDLE

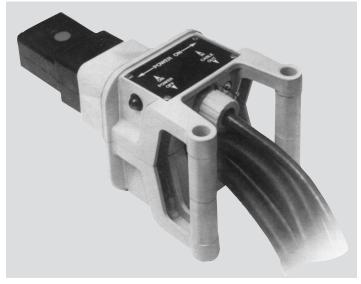


# ATTACHABLE® HANDLE FOR 400 HZ. GROUND POWER CONNECTORS

- CONVENIENT
- LIGHTWEIGHT CLAM SHELL DESIGN
- COMPATIBLE WITH ALL COMMERCIAL AIRCRAFT
- ACCEPTS SINGLE-JACKETED CABLE or Multiconductors



HANDLE WITH ON/OFF SWITCHES AND 3 LED's (31G35)



**HANDLE WITH CABLE ASSY (30G1)** 

Anderson's ATTACHABLE® Handle provides a convenient method of coupling the ground power connector to the aircraft. The design features replaceable, weatherproof switches for controlling ground power and the cable retriever at the connector. This eliminates the need for cumbersome control boxes attached to the cable assembly. The handle is available without switches for applications that do not require remote control.

Fabricated from a unique lonomer material, the handle combines light weight (2 lbs/1kg) with exceptional impact characteristics. It is impervious to typical aircraft fluids

such as jet fuel, skydrol, glycol and water.

The design offers protection for the power connector and a convenient hand grip to make engaging and disengaging easier. This helps reduce strain on the connector due to mishandling. An outer flange prevents the connector from laying on the ground, reducing abrasion of the connector and potential danger in wet locations.

Unlike other connectors with integral switches, the ATTACHABLE design allows easy replacement of the switches or the connector. A time-saving advantage available only with the ATTACHABLE® approach.

30G1

Handle Assembly Non Electrified

**30G1** Handle Assembly Electrified

(Requires switch, cable connector and indicator lamp.

30G2 Adapter

31G35

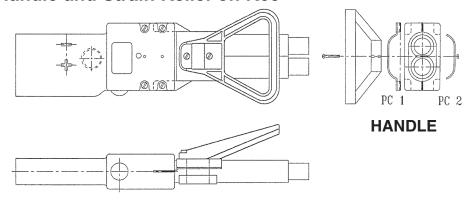
Handle Assembly with on/off switches; 3 LED'S and Sensing

ATTACHABLE® is a Registered Trademark of Anderson Airmotive Products

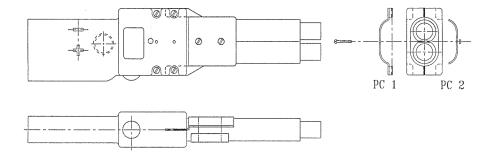
# **DC Handle and Strain Relief**



# DC Handle and Strain Relief on R65



# DC Strain Relief on R65



The DC Handle and Strain Relief design offers protection for the power connector and provides a convenient hand grip to make engaging and disengaging easier. This helps reduce strain on the connector due to mishandling.

## **Order Information:**

Strain Relief Kit: Part No. — 120012G1

Handle: Gray Polycarbonate Plastic Part No. — HDLG Red Polycarbonate Plastic Part No. — HDLR Insulated non-corrosive steel Part No. — HDLM

# The Anderson Family BATTERY CONNECTORS



# Battery Connectors - CAT. NOS. R121, R125, 4657B



## Corkscrew plugs and receptacles lock into compact, rugged connections

#### The connector

Corkscrew locking plugs and receptacles provide compact, weathertight connections for quick indoor or outdoor battery charging and numerous other electric vehicle, industrial and aircraft applications.

For maximum conductivity with minimum corrosion, all contacts are silverplated copper. Even after salt-spray exposure electrical resistance stays minimal.

### The plug

Plug mechanisms are encased in a durable Hypalon insulation housing. Stainless steel garter springs reinforce the socket-type contacts to increase mating pressure and make each connection equally reliable. Intergrally designed gaskets seal the mated connector.

The plug models differ primarily by means of termination and current rating. Catalog number R121 is a convenient no crimp no solder setscrew termination. Catalog number R125 provides the precise fit and rugged connection of a conical lug termination, which is retained in the plug with an allen-type screw.

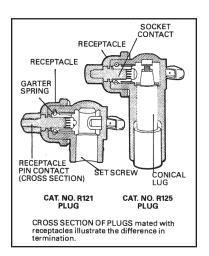
A screw-lock mates the connector tightly enough to withstand severe vibration and physical shocks. It is operated by a twist handle which positively connects and disconnects the plug. The handle also indicates the state of the connection by its position.

## The receptacle

The receptacle is flanged for surface mounting. Pinstyle contacts are molded into the glass-filled thermoset plastic housing. Hardware is plated to resist corrosion.

## **Applications**

The corkscrew is a versatile, high performance connector, that may be used for weatherproof battery charger and intercomponent connections in electric vehicles; as a stand-by power connector in computer systems; or as a ground power connector in marine, air and rail transport. It is recommended for other similar applications, or wherever hydraulic fluids, oils, acids and other such potentially destructive elements could shorten the life of another connector.



# data table

CATALOG NUMBER AMPERES, CONTINUOUS VOLTS	PLUG R121 250 125	PLUG R125 300 600	<b>PLUG RECEPTACLE</b> 4657 300 600
CONNECT-DISCONNECTS	120	-	555
no load	at least 5000 time (all)		
load	for disconnect use only (all)		
AWG CABLE SIZES	6-3/0	10-4/0	10-4/0
MAXIMUM CABLE O.D.	3/4"	1"	
CABLE CONNECTION	set screw	conical lug*	threaded pin
CONTACT TYPE	socket	socket	
CONTACT MATERIAL	silverplated copper (all)	SOCKEL	
CONTACT RESISTANCE	approximately 75 micro-ohms maximum	after 100-hr salt spray test	
CONTACT MATING FORCE	<12 inch-pound torque (all)	and too in dail opiny tool	
AUXILIARY CONTACT	available – consult factory		
TEMP. RISE ABOVE AMBIENT	<30°C with largest cable rated-continuo	us duty (all)	
ENVIRONMENTAL RESTRICTIONS	-	- , ,	
AMBIENT OPERATING TEMP.	-40°C to + 71°C (all)		
WEATHERPROOF	yes†	yes†	yes‡
OTHER TESTING	vibration, temperature, shock, dielectic s	strength, fungus, salt spray, hum	idity, hydraulic fluids, acid,
	alkali, lubrication oil		
HOUSING COLOR	black	black	black

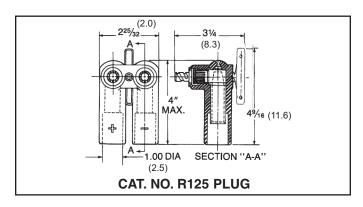
<sup>\*</sup>crimp or solder contact \*\* shrink tubing over connector sleeve-to-cable joint and potted set-screw holes required

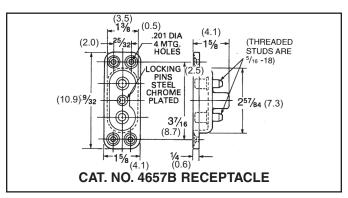
# BATTERY CONNECTORS

# Battery Connectors - Plugs and Receptacles

# **DIMENSIONS**

# (6.7) 23/8 (6.0) SECTION "A-A" ¾ DIA CAT. NO. R121 PLUG





SUGGE	STED CRIMP			
AWG Size	Tool	Nest	Indentor	
6		A6CD	Y34PL-1	
5-4	Burndy	A2CD	Y34PLA	The cat. no. R125 Plug is
3-2	Y34A	A1CD	Y34PLA	covered by the following patents:
1	Hypress	A25D	Y34PA	U.S. Patent 2,917,722
1/0	or	A26D	Y34PA	Canadian Patent 612,047
2/0	equivalent	A27D	Y34PA	
3/0		A28D	Y34PR-5	
4/0		A29D	Y34PR-5	

ORDE	ERING IN	IFORMA	TION
set screw terr	nination		
	AWG Size **	Metric mm	Catalog Number
	#6-3/0	(85)	R121
lug termination	on (lugs incl	uded)	
	AWG Size **	Metric mm	Catalog Number
	10	(5)	R125G1
	8	(8)	R125G2
_ n	6	(13)	R125G3
	5-4	(17-21)	R125G4
7 70 1	3-2	(27-34)	R125G5
	1	(42)	R125G6
	1/0	(53)	R125G7
	2/0	(67)	R125G8
	3/0	(85)	R125G9
	4/0	(107)	R125G10
lug sets (repla	acement)		
	AWG Size **	METRIC mm	Catalog Number
[	8-10	(8-5)	970
	12-10	(3-5)	971
22	8	(8)	972
6///	6	(13)	973
a 0	5-4	(17-21)	974
	3-2	(27-34)	975
Two lugs	1	(42)	976
per set,	1/0	(53)	977
with	2/0	(67)	978
hardware	3/0	(85)	979
	4/0	(107)	980

### ordering information Receptacle



Description***	Catalog Number
Black with threaded studs	4657B

<sup>\*\*</sup> Soldering is recommended for cable sizes 10 through 8 AWG. For Cable sizes 6 through 4/0 AWG, see suggested crimping tool.

# AC, DC QuickBreakaway® QB

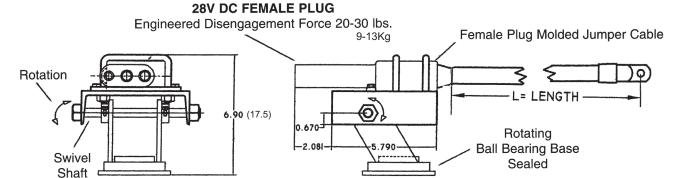


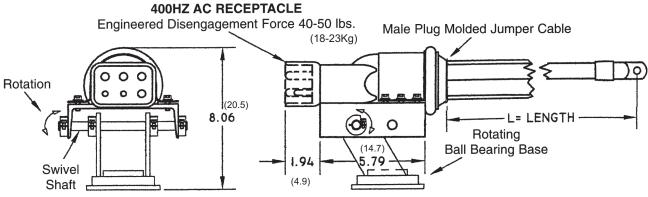
# Principle:

The QuickBreakaway® is designed to disconnect the power cord from the source (GPU or Bridge) without damage to the equipment if operators fail to disconnect the power cable.

### Operation:

The QB is a rugged ball bearing swivel assembly that rotates the male or female plug jumper cable 360° in the direction of pull. The male-female configuration is designed to disconnect at about 50% of the normal disconnect force; thus, the connection will break at the QB assembly on the power source if the plug is not disengaged at the plane.





### Installation:

The QB can easily be installed on a GPU or on a bridge through the mounting holes in the base. Adaptors are available for mounting. The jumper assembly hooks up to the power source output with terminal lugs and is customized for length based on the application.

The power cable will require two female connectors or a male-female depending on configuration; one connector plugs into the QB and the other provides power to the plane.

			<u>DC</u>	<u>AC</u>
Order Information:	A. 360° Swivel Base	Э	QB-DC	QB-AC
	B. QB Jumper	Male	R68GxxEQB-xM	R112GxxEQB-xM
		Female	R65GxxEQB-xM	R67GxxEQB-xM
	C. QB Cable Assy	Double Female	R65GxxE-2-xM	R67GxxE-2-xM
		Male/Female	R68GxxEQBR65-xM	R112GxxEQBR67-xM

® QuickBreakaway (QB) is a registered trademark of Anderson Airmotive Products Co., Inc.

# The Anderson Family Options & ACCESSORIES



# Lug Sets

<u>Cable lugs</u> for crimping or soldering to cable prior to assembly into Attachable<sup>®</sup> plugs. R65, R67, R71 Series, R125, R68, R112, R765, R768, R771

Cable lug set	:s		
	AWG Size **	Metric	Catalog Number
	12-10	(3.3-5.3)	971
200	8-10	(8.3-5.3)	970
	8	(8.3)	972
66	6	(13.3)	973
	5-4	(17.2-21)	974
	3-2	(27.4-33.6)	975
Two lugs	1	(42.4)	976
per set,	1/0	(53.5)	977
with	2/0	(67.4)	978
hardware	3/0	(85)	979
	4/0	(107.2)	980

<u>Terminal lugs</u> for crimping or soldering on to cable.

Terminal lug sets						
	AWG Size **	Metric	Terminal Lug Set	Terminal Lug Set Catalog #		
20, 20	12-10	(3.3-5.3)	3/8" (0.9) hole T971	1/2"(1.3) hole T971-1		
	8-10	(8.3-5.3)	T970	T970-1		
	<u>8</u> 6	(8.3)	T972 T973	T972-1 T973-1		
	5-4	(17.2-21)	T974	T974-1		
Two lugs	3-2	(27.4-33.6)	T975	T975-1		
per set	1	(42.4)	T976	T976-1		
	1/0	(53.5)	T977	T977-1		
	2/0	(67.4)	T978	T978-1		
	3/0	(85)	T979	T979-1		
	4/0(107.2)	(107.2)	T980	T980-1		

# **Crimp Tool Recomendations**

# VERSA-CRIMP® HYDRAULIC COMPRESSION TOOL HAND OPERATED TYPE VC7

### **Die Less**

 The original notched-top VERSA-CRIMP compression tool allows direct access of the tool to the connector for compressing multi-strand/rope lay copper cable in mining, marine and industrial applications.
 Copper color label denotes use with copper connectors, only with 360° head rotation.

### Includes:

 High impact plastic carrying and shipping case with Service Manual and 2-Year warranty.

Notes: 1) Due to high pressure developed by this tool, it is not to be used on aluminum connector or cable.

- add suffix "D" to catalog number for neoprene covered head.
- 3) Type VCHTG, Direct Reading Pressure Gauge, is used for checking operating pressure.

® Anderson Electric TOOL VC7



**TYPE VC7 - Hand tool** 

Conductor Range — #6 Str. —500 MC MBare Cu Approx. Wt. Each — 10.5 lbs. (4.7 kg.) Also available as bench mounted

# Rotating Hex Die Hand Crimper (CT-090)

RANGE: #6 AWG TO 4/0 AWG

LENGTH: 25.5 inches WEIGHT; 6.5 lbs.



#### **CT-090**

## **Hex Die Crimper**

MS25441 Crimper with 12 ton Hydraulic Head and appropriate MS90485 crimp dies. T&B or equivalent

# ACCESSORIES (cont'd)

# **Environmental End Caps**

Protect end of connector from dust and environmental damage



AC END CAP FOR PLUG 2-8300P1



AC END CAP FOR RECEPTACLE 2-8300P2



DC END CAP FOR RECEPTACLE 2-8299P2

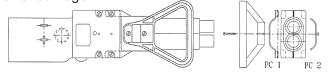


DC END CAP **FOR PLUG** 2-8299P1

### Strain Relief for DC Cable Assemblies

Protect end of connector from dust and environmental damage





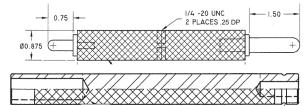
Order Information:

Strain Relief Kit: Part No. - 120012G1

Handle: Gray Polycarbonate Plastic Part No - HDLG Red Polycarbonate Plastic Part No. — HDLR Insulated non-corrosive steel Part No. —HDLM

## **Test Pins**

- 1. For checking plug wear on Power and Auxiliary female contacts Order: TPM
- 2. For checking receptacle power pin and auxiliary pin wear Order: TPF



#### **Scuff Covers**

Protects cables from direct contact with ground and eases sliding.









Supplied in 30 feet max increments; Order SC-xx



R65G3E-3SK

**Splice Kits** DC & AC See page 14,15,16 for options.



AC SPLICE KIT R67G36E-3SK

# ACCESSORIES (cont'd)

# **Replacement Noses**







R90 Kit 1SW R91 Kit 1SW

R901 (Black), R901Y (Yellow)

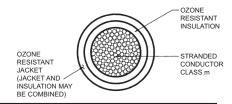
Double safety nose option can be added to both APN and Wear Nose. Add DS as prefix. The DS will disconnect plug if resistance is too high when properly connected.

# **Cable Options**

### MIL-C-5756 C

Super flexible ozone **RESISTANT** 1/0 H 2041P2 2/0 H 2042P1 4/0 H 2044P1

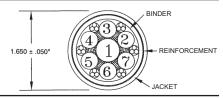




# Single Jacket Balanced Composite Cable

260A 400 Hz # 81501 300A 400 Hz #81502

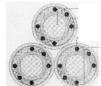




### **Betajet®**

50 MM #81503 70 MM #81504





®BetaJet registered Trademark Leoni Studer Cable
 Other Cable Available - Welding, TPE Insulation, etc.

# Assembly Kit

Order No. 111239G2



# Strap Hanger

Relieves stress on plugs for longer cable assembly life.

Order No. AAP00416



SPECIALS

# ANDERSON AIRMOTIVE CAN ENGINEER SOLUTIONS TO YOUR SPECIAL POWER CONNECTION REQUIREMENTS



MS 3108 with R67G11E



28V DC Helicopter Plug 250 MCM R83, R84



R65 with SB Anderson Power Products
Battery Connector

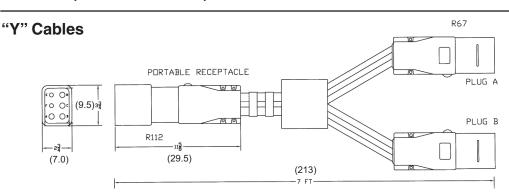


R65G3E with R125 BATTERY PLUG



MS 27285 Male with MS25486 PLUG





AC + DC "Y" available designed so that both output plugs have to be plugged in to power up.AC Part # R112GxxER67GS2-7A DC Part # R68GxxER65-GS2-7A

# CONVERSION OF AMERICAN WIRE GAUGE TO METRIC SYSTEM

AMPERES SINGLE COND.			AREA			APROX. DIAMETER	
SIZE COND. AWG 75° C OR COPPER MCM (NFPA)	CIRCULAR	SQUARE INCHES	SQUARE	INCHES CLASS M (NEMA)	mm		
20	7	1020	0.0008	0.52	0.038	.97	
18	10	1620	0.0013	0.82	0.048	1.22	
16	15	2580	0.0020	1.31	0.060	1.52	
14	20	4110	0.0032	2.08	0.078	1.98	
12	25	6530	0.0051	3.31	0.101	2.57	
10	40	10380	0.0082	5.26	0.126	3.20	
8	65	16510	0.0130	8.37	0.162	4.11	
6	95	26240	0.0206	13.30	0.215	5.46	
4	125	41740	0.0328	21.15	0.269	6.83	
2	170	66360	Ó.0521	33.62	0.337	8.56	
1	195	83690	0.0657	42.41	0.376	9.55	
1/0	230	105600	0.0829	53.50	0.423	10.74	
2/0	265	133100	0.1045	67.43	0.508	12.90	
3/0	310	167800	0.1318	85.01	0.576	14.63	
4/0	360	211600	0.1662	107.2	0.645	16.38	
250	405	250000	0.1964	126.7	0.713	18.11	
300	445	300000	0.2356	152.0	0.768	19.51	
500	620	500000	0.3927	253.4	0.997	25.32	
750	785	750000	0.5891	380.0	1.207	30.66	
1000	935	1000000	0.7854	506.7	1.404	35.66	